Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

NOTES ON LIVING NAUTILUS.

BASHFORD DEAN.

During a recent visit to Manila I learned from Commissioner Dean C. Worcester that Nautilus, a form which one usually associates with remote and cannibal islands, could be collected quite readily in the straits between the islands of Negros and Cebu. This locality was accessible, and a short stay there, I was told, would afford one an opportunity of examining this, the only living picture of orthoceratids and ammonites, to say nothing of its greater interest as the probable key to the puzzles of cephalopod descent. So it came about that I visited Negros. Thanks to the kindness of Professor Worcester, the trip itself proved a zoölogical excursion *de luxe*, for he secured for me the services of his long-time guide, the taxidermist Mateo Francisco, and he put us in charge of his good friend, Don José Bocanegra, whose large sugar estate is near the town of Bais. It was during this trip that the following notes and sketches were outlined. They have been allowed to stand practically as jotted down, as first impressions, — with my apologies, and a dedication, if they are worth one, to the student of Nautilus, my good friend and former colleague in Columbia University, Dr. Arthur Willey.

Nautilus is doubtless common throughout the waters of the southern Philippines.[1] It can, however, be obtained so readily in the region of southern Negros that such a station, if only because of its accessibility, deserves to become a classic one. The reason why a deep-water form like Nautilus can be secured with little difficulty here is a simple one: it is a regular by-product, so to speak, of the traps of the fishermen. Its

---

[1] I note, in passing, that dead shells of Nautilus occur not uncommonly as far north as Japan. One was picked up a few years ago near the laboratory at Misaki (lat. 35° 10′ N.).

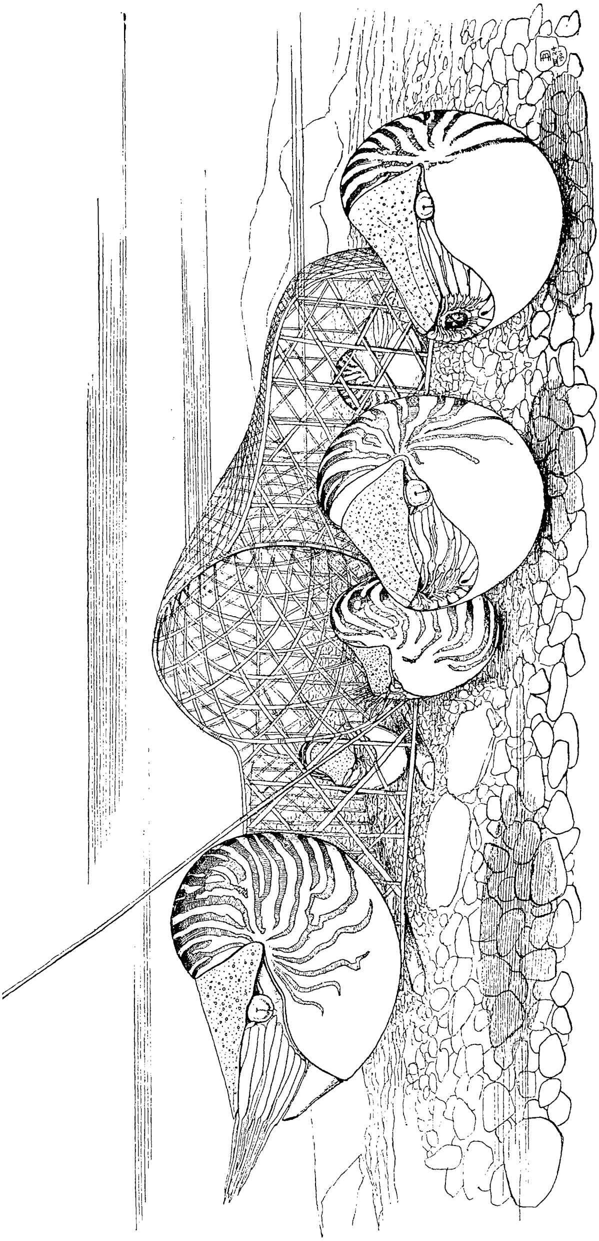


Fig. 1. — Sketch illustrating living Nautilus. In the background the Philippine fish-trap in which they are taken.

flesh is, indeed, eaten, but it is little esteemed. The shells have hitherto found little market; locally they are used as drinking cups, or flower vases, and are sometimes cut into roughly shaped spoons. But they are now bought extensively by Chinese shopkeepers, and at such good prices that there will probably be a goodly Nautilus fishery before long. The Chinese, I was told, export the shells to China, where they are used as material for button-making.

The best catches of Nautilus are made in deep water, that is, according to the estimates of the fishermen, at a depth of from 250 to 400 braças (= about 450–700 meters). I notice, however, that in the Spanish charts the maximum depth recorded is 200 meters, and it is probable accordingly that either the fishermen make extraordinary allowance for the sag of their line, or that the measurement given on the chart represents the maximum sounding limit of the Coast Survey steamer. As the water shallows, Nautilus becomes less abundant : in water of 100 meters it is still taken, although in small numbers. A single specimen, as Señor Romero informed me while at Bais, was collected in that bay by the native divers while gathering pearl oysters. There can, I believe, be little doubt of this instance, for my informant is well acquainted with Nautilus, and states that the animal was brought to him living. It was obtained in water less than 4 m. in depth.

The most favorable station thus far discovered is, as Professor Worcester stated, near the small fishing village Manjuyod, about six miles distant from Bais. This and other localities where I learned that Nautilus is taken are indicated in the accompanying outline map (Fig. 2). That it is taken off the villages of Cebu, Malaboyoc, Ginatilan, and Sambuan, I know only from hearsay. I was told that a Chinese shopkeeper made a tour of these places and collected 3000 shells; and he reported that the fishing was done not far from shore. In the locality indicated, near the pueblo of San Juan on the southern coast of Siquijor, Nautilus is taken in relatively shallow water, 100 m. and less; here, however, its abundance is inconstant. In this neighborhood I picked up a shell 3 cm. in diameter.

Season of the year has an important bearing upon collecting. Spring and early summer are the most favorable, probably because the water is quiet in the absence of the northern monsoon. June is generally stated to be the month in which the largest catches are made, as many as twenty shells having been taken in a single basket. The least favorable season is winter, for the wind sweeps down the straits between Negros and Cebu, raising a sea which soon swamps the small prahus of

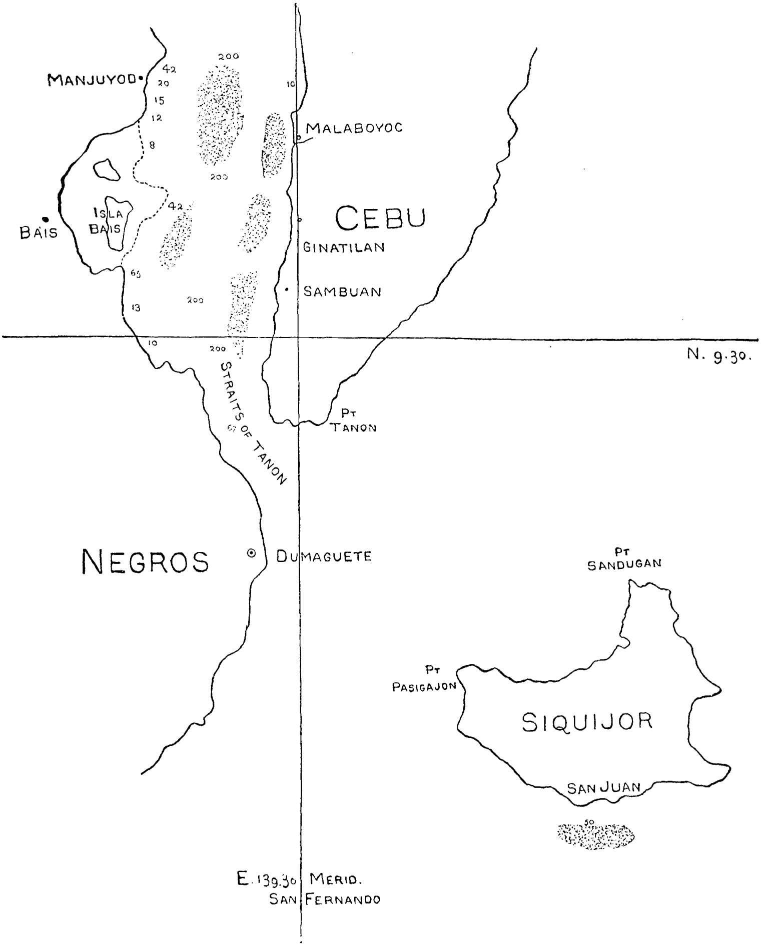


FIG. 2. — Outline map of the neighborhood of Bais, southern Negros, showing in stippled areas some of the fishing grounds for Nautilus. (After Spanish coast chart.)

the fishermen. It happened, therefore, that at the time of my visit, in January and February, I was able to get but few specimens.

The fishing, as has already been stated, is carried on by means of a fish-trap, a sketch of which is given in Fig. 3. It is a cage-like, flattened affair, about six feet in length, constructed of strips of bamboo woven in coarse mesh. At one end there is a funnel-shaped insinking through which the animals gain entrance. The funnel operates somewhat on the plan of the mouth of a rat live-trap, the animal pushing through it, not indeed at the pointed end, but on one side (the median ventral line, to borrow a phrase). Intercrossing strips then close elastically and prevent egress. The cage stands upon stout strips of bamboo, to which weights are usually attached. Bait is hung from the roof supports at various points. This consists of whole fowls, viscera or joints of kid, or the remains of dogs or cats when the latter attractions can be found. Freshness of bait is not regarded as a *sine qua non.* The cage "bo-bo," as it is called in Viscaya, is attached, in the way shown in the figure, by a strip of rattan, to the main line, also of rattan, which connects it with the float. The latter consists usually of several joints of bamboo. As to the method of fishing, it appears that the bo-bo is put down at a favorable opportunity, and is allowed to remain for several days, often for a week or longer. At San Juan I found that it was customary to examine the cages on stated days, weekly or

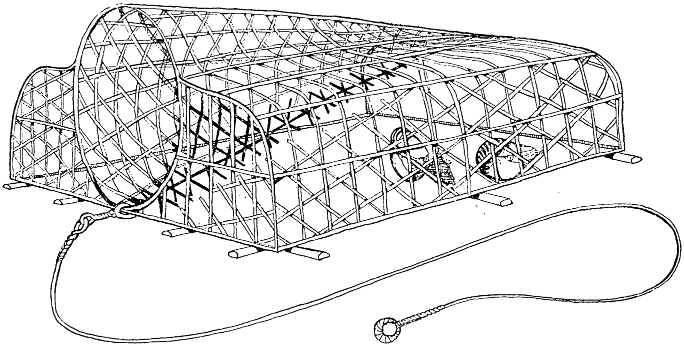


FIG. 3.—The Negros fish-cage, or "bo-bo," in which Nautilus is taken.

bi-weekly ; at Manjuyod, on the other hand, visits to the cages are made at irregular intervals. The bait is then renewed, the captured fish removed, — this through a trapdoor in the bottom, — and the apparatus sunk again to the bottom.

In the accompanying cut (Fig. 1) I have attempted to represent a bò-bo in position, with Nautilus in and around it. This, I believe, gives a moderately accurate idea of some of the positions assumed by the animals. Several are represented, partly retracted, in a position of rest, and one of them, attracted by the bait, is shown swimming rapidly near the bottom somewhat in the direction of the cage. The degree of shadow is, of course, hypothetical, and it is doubtful whether the bottom is as free from other living forms as I have indicated.

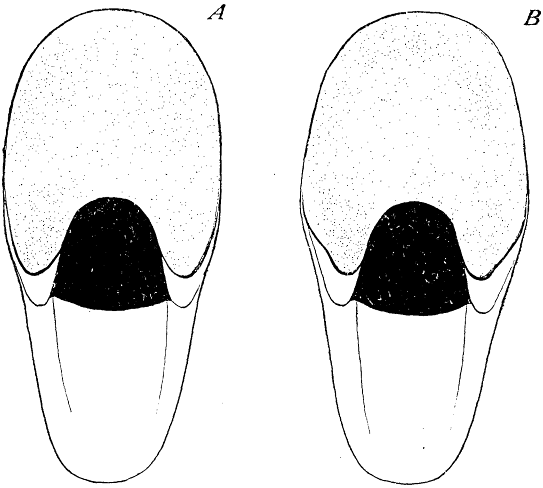


FIG. 4, *A* and *B*. — Diagrams of shells showing in stippled areas the oral apertures of male (*A*) and female (*B*) Nautilus.

The Shell. — In examining fresh specimens I noticed that there appeared to be sexual differences in the shells. That of the female was wider at the sides of the oval aperture and here showed a somewhat angular contour. This peculiarity I have expressed in the accompanying Fig. 4, *B*, and it may be contrasted with the condition of the shell of a male shown in the same figure, *A*. This difference was clear in the case of the six specimens I examined ; but I later found that there must be considerable variation, for in looking over the shells obtained at Manjuyod I was unable to distinguish those of the females from those of the males in as many instances as three out of ten.[1]

Another character of the shell is the great number of irregular growth lines which they often present (Fig. 5). These lines show frequently, as in the figure at *, an undulation of a somewhat regular pattern, reminding one of the markings formed at the septal rims in Ceratite or Goniatite. Doubtless this peculiarity in recent shells has already been commented upon, and the point made that the irregular growth lines cannot be directly related to those of the fossil forms, since they are not connected with the formation of septa, several being sometimes found on the wall of a single chamber. They are interesting, however, I suggest, as representing a tendency during special periods of shell-forming activity, perhaps after

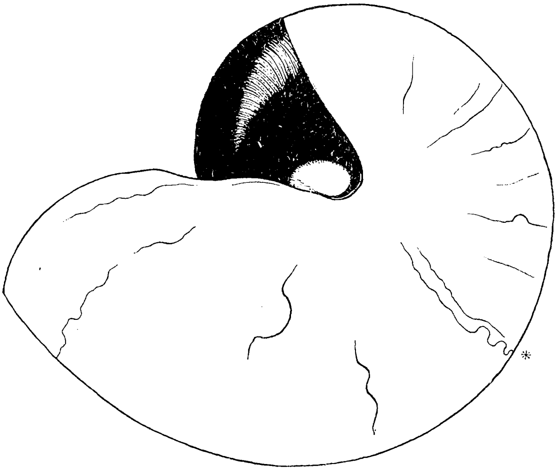


FIG. 5. — Shell of Nautilus. Outline sketch showing undulatory lines of growth.

---

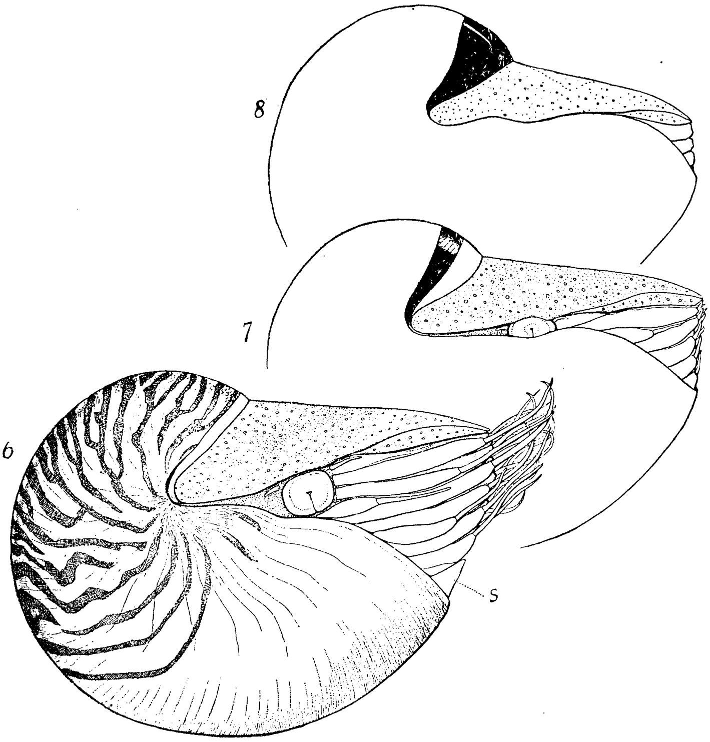
[1] I find that Willey gives (1895, *Nat. Sci.*, p. 412) a similar note, stating that "in most adults the shell can readily be identified as belonging to male or female, but often this identification is very difficult, and in young shells impossible." He figures extremes of difference.

some unusual shock has been given to the free rim of the shell, for the mantle to contract in crenulate lines, a tendency which during the descent of the tetrabranchs may well have been seized upon by selection and made of use in the formation of the specialized margins of the septa. And from this standpoint the recent markings may be regarded as related to the curiously expressed lines on the ancient shells. They seem of entirely too regular a character, as close examination shows, to be interpreted merely as lines marking the repair of the free lip of the shell. Such lines of repair do, indeed, occur and are common, for the shell-lip is delicate and often apt to be injured in an animal with the evident habits of nautilus. I have in mind one instance when the shell had been repaired, after the lip had been crushed badly ; in this case the main fracture passed backward from the rim of the lip to a distance of 4.5 cm.

General Appearance of the Living Animal. — The first glimpse at a living specimen showed it at the bottom of the vessel in which it had been brought, its position upright somewhat as shown in the present Fig. 6. If the vessel is sufficiently large the animal is usually found with its back (*i.e.*, its aboral pole, so to speak) pushed as far as possible into a corner. And if several specimens are thus confined they will often be found to have backed away from one another as far as possible. They remained thus almost motionless sometimes for hours ; at other times they will exhibit active movements and subside quite suddenly. The color of the animal one gets little idea of from preserved specimens. The general color of the exposed parts, hood excepted, is white, clean, opaque, almost the same tint, in fact, as the body of the shell. The latter was in every case I observed brilliantly clean. The face of Nautilus, then, is white, as is also the dorsal fold of the mantle, which rises into sight within the concave hinder rim of the hood and covers when extended the jet-black portion of the coil of the shell. The dorsal surface of the hood, as one would infer from preserved specimens, is of a brownish color. Looking at this surface for the first time in a living specimen, one is given the impression that it has been spattered with burnt umber, raw sienna, and yellow ochre, and that the pigment has then been carelessly wiped away, leaving the warty prominences in white relief. Nowhere are observed the characteristic chromatophores of the dibranch. The only pigmentation which may further be noted is on and around the eye, and in the creases between the thickened proximal portions of the oral tentacles, also on the edge of the mantle, margining the oral aperture; from this the shell itself receives an inky border, which is continued from the blackened portion of the coil around the entire aperture. This line measures about 2 mm. in width and can be detected from the outer surface of the shell; it does not appear, however, in shells which have been carelessly cleaned.

Nautilus, as far as my experience goes, lives but a short time in confinement, twenty hours being the longest time I was able to keep one alive. And even from the beginning the animal was evidently not at its best. It is true that the conditions under which I observed them were unfavorable, for in no case were specimens brought me which had been confined less than three hours in a water bucket. And the best aquarium I could improvise was a tank which held only about two hundred liters of water. Changing the water at frequent intervals had little effect in keeping the animals alive. I soon found that it was difficult to know just when the animal did die, for it retains a very lifelike position. This I discovered as follows: with a view of finding whether at any time movements became more active I caused my helper to watch a specimen throughout the night, the man to call me in case it showed change of position or any peculiar behavior. In the early morning I was told that the animal had shown no movements, a statement I soon had little reason to doubt, for I found my Nautilus dead. On returning it to the water I observed that it floated, retaining, however, its customary position; and so it stayed in spite of my efforts to cause it to sink. This is the only case in which I observed a specimen remain at the surface; and the thought suggested itself that it was from such floating specimens that the idea originated that Nautilus was more or less a surface form.

The usual position and appearance of nautilus in confinement are sketched in Fig. 6.[1] It will be noted that the lower rim of the hood lies in approximately a horizontal position, the dorsal fold of the mantle protruding slightly above the concave hinder rim, entirely concealing the black portion of the shell. The



FIGS. 6, 7, 8. — Diagrams showing the position of Nautilus at different stages of closing.

---

[1] In the photograph which Willey has given (*Q. J. M. S.*, 1896, p. 179), the living specimen appears to be somewhat droopy, or perhaps it is just recovering from its alarm at being confined in so small a vessel, evidently a museum jar. Thus the base of the hood has shrunken away from the shell, especially at the sides (but then this is not unusual), and the dorsal fold of the mantle which normally rises to the upper margin of the black area of the shell can hardly be seen; the tentacles, too, sag down in a way which I think rather uncustomary, cramped, perhaps, by the smallness of the glass vessel. My impression, too, is that they have drawn down the ventral lip of the shell somewhat lower than is usual. How easy it is, though, to criticise a zoölogical result, even in the form of an admirable photograph, and to forget that it may have been my own specimens that were sickly!

eye protrudes conspicuously, but not, however, beyond the plane of the surface of the shell; its lower rim lies more or less within the lateral indentation of the shell's aperture. This indentation, as will later be seen, is apparently a provision to enable the animal to see, even when largely retracted. The tip of the siphon is also seen to protrude (*S*), and between it and the hood lie the closely arranged oral tentacles. When the animal is in this position the proximal ends of the tentacles appear long, narrow, and moderately well rounded; the distal portions taper out delicately, the tips extended and weaving together, somewhat as shown in the figure. Examining a similar specimen from in front (Fig. 10), we observe a more or less regular arrangement of these tips of the tentacles; they cluster together, lying in the main in front of and almost concealing the opening of the mouth. In this position the shape of the dorsal surface of the hood is well shown; there is a median flattened tract from which the sides shelve away, moulding the hood to the whorl of the shell and to the region of the eyes and tentacles. Looking at a specimen from above, we obtain the appearance shown in Fig. 12. This, however, pictures a more retracted stage. It will be seen that the hood is neatly adjusted to the outline of the aperture of the shell. Anteriorly the distal ends of the tentacles protrude in a tuft and are arranged quite symmetrically.[1]

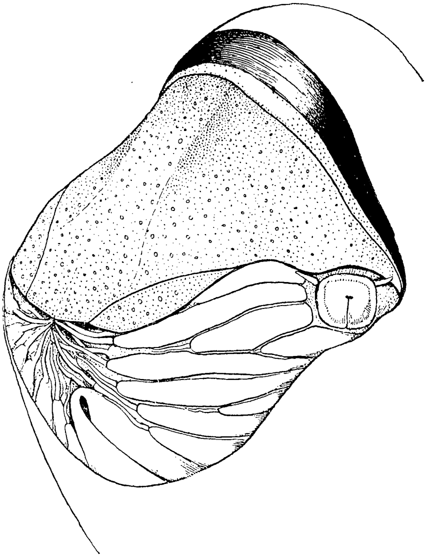
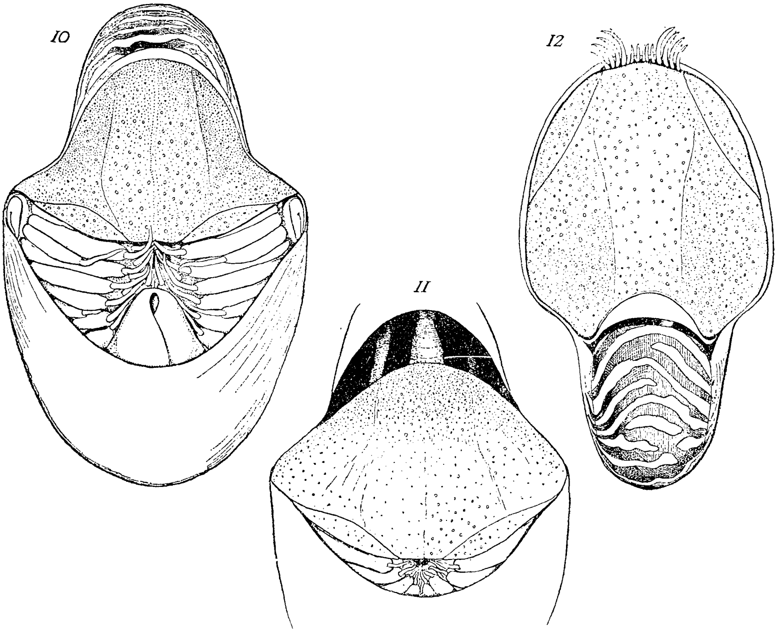


FIG. 9. — Nautilus somewhat retracted, in resting position. Oral region, shown in three-quarter view.

---

[1] Willey (*Q. J. M. S.*, 1898, Pl. X) figures them in complete extension, diverging widely at the sides of the head, and still symmetrical in position.

Appearance when retracting. — When a specimen is picked out of water (and it bears handling with considerable composure) it slowly retracts, presenting the appearance shown in side view in Figs. 7 and 8, in three-quarter view in Fig. 9, in dorsal view Fig. 12, and in oral view Fig. 11. The first symptoms of retraction are seen in the shortening of the tips of the tentacles and in the drooping of the hood. These processes are more or less rapid, depending upon the condition of the animal ; and I am led to believe that under normal circumstances retraction can take place very quickly. In the shortening of the tips of the tentacles the fleshy proximal portions become notably stouter, at the same time more angular in section, dovetailing one beside the other so tightly that their common outer surface is flattened where it is later to be opposed to the inside of the shell. Observe also that the hood becomes notably depressed, at the same time exposing the dorsal rim of



Figs. 10, 11, 12. — 10, Nautilus, front view, showing oral region, at an early stage of retraction. 11, Oral region at a late stage of retraction. 12, Dorsal aspect of Nautilus resting and partly retracted, showing tentacles.

the mantle; this then recedes, exposing the blackened portion of the shell. The eye is still seen peering over the notch at the lip of the shell. In this stage of retraction the animal will often remain for many minutes; if handled somewhat roughly it will retract still further, presenting a stage of closure shown in Fig. 8. Here the hood has closed over the aperture of the shell like a lid, or rather like an operculum; it has shrunken and flattened somewhat at the same time; behind it the mantle has receded, leaving the blackened area of the shell much in evidence. At the anterior end (Fig. 11) can still be seen the turgid ends of some of the tentacles. The final closure of the aperture of the shell appears to take place by the bending down of the anterior flap-like portion of the hood, a process, however, which does not readily occur. Only by sharply stimulating this region have I seen total closure, and even then but for a few moments. If undisturbed, even if kept out of water, the animal slowly reopens. The hood first rises sluggishly, often separating itself behind from the shell, and the tentacles begin to protrude. More slowly does the mantle expand again over the blackened area. If still kept out of water the tentacles protrude and hang down over the edge of the shell in a flaccid mass.

If an animal be taken out of water and held in an inverted position it will at first close just as has been described. After some time, hours (Professor Worcester tells me) in the case of specimens just out of water, minutes in the case of those which have been kept in aquarium, the heavy fleshy "head" of the animal will begin to droop downward, and will finally appear as shown in side view in Fig. 14 and in ventral view in Fig. 15. Whether under such circumstances the animal will ultimately fall out of its shell, I neglected to observe. I found, however, that by this means one can readily remove the animal from the shell and without breaking the delicate siphuncular tube. The muscles attaching the body to the shell occupy very definite areas within the latero-dorsal region of the aperture and at the sides of the coil of the shell; and these areas are landmarked quite clearly in the inverted animal. The muscles may accordingly be separated from the shell, one's finger-tips answering adequately for the purpose. Before the operation is completed, however, the siphuncular tube should be loosened; this is effected by thrusting the hand within the shell below the siphon. At such treatment the animal retracts, but after several attempts the finger-tips find their way to the base of the siphuncle. In the inverted position the animal presents several peculiar features. The hood is bent and misshapen, and evidently possesses considerable plasticity. Adjacent to it the black portion of the shell is largely exposed, owing to the retraction of the mantle. The tentacles are tumid, retracted, and are closely pressed together. The eyes stand out prominently, like mushrooms. The siphon shows its broad separation from the tentacular portion of the head, and hangs downward as a stout, muscular mass; at its base on either side droops a thin fold of the mantle (*MA*). Of this the inky black edge corresponds to the black line already referred to as lying within the aperture of the shell. The entire mantle is now greatly retracted: its posterior ventral rim (*MP*) exposes a portion of the extensive mantle cavity, in which, although not shown in the figure, can be seen the gills. The animal while in this position is observed to give an occasional gasping movement which involves the adjacent mantle rim as well as the siphon folds; these are expanded and contracted quickly.

The Tentacles and their Movements, Extension and Retraction. — Extension and retraction play an important and constant part in the economy of these organs. The maximum extension observed is about as shown in Fig. 8; shortly after death it is possible, however, to draw out the tentacles considerably further, to the degree which I have indicated in the swimming Nautilus of Fig. 1, or in the diagram, Fig. 13, *C*. Indeed, I suspect that the tentacles can be everted even further than this, should the animal be so disposed. It is of course doubtful if this protraction can be carried to the degree which would cause the obliteration of the distinct boundary line which separates the distal from the proximal portion of the tentacles. Judged from their varied movements, these organs have come to be highly specialized in the matter of lengthening and shortening, if for no other purpose than that of their protection within the shell. How these processes came to be evolved there is no good evidence for determining; an attractive hypothesis would connect them with the transverse foldings which permit the tentacles to serve as adhesive organs. And one can readily conceive that a process of shortening based upon the principle of transverse folds would result in the production of one highly effective fold, to the loss or detriment of the rest. This highly serviceable fold would of course be represented in the present boundary between the proximal and distal portions of the tentacle. According to such a view the proximal portion has now lost all traces of transverse segmentation, becoming, in fact, but a kind of sheath for the rest. The distal portion, on the other hand, on account of its varied movements, has still retained them. It will accordingly be seen that the slender distal portion of the tentacle is not to be regarded as the homologue of a single highly specialized sucking organ, as some writers have maintained. There is, I believe, no evidence that such sucking organs are to be looked for in the tetrabranch division of the cephalopods. On the contrary, this division, possessing tentacles many in number and adhesive at a multitude of points, could scarcely have required the specialized sucking rings which characterize the few-armed cephalopods.

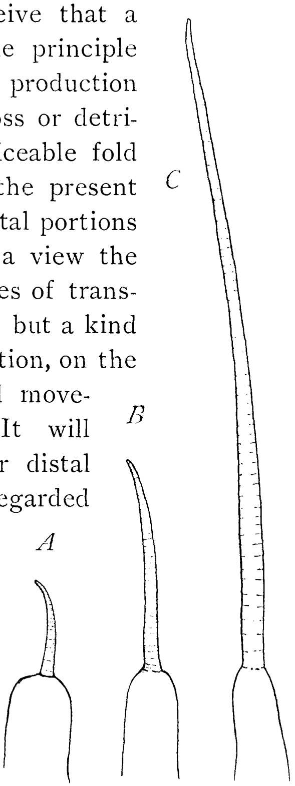


FIG. 13. — Diagram of tentacle at different stages (*A*, *B*, *C*) of protrusion.

The Movements of Nautilus. — In captivity Nautilus remains in one position, sometimes for hours. This sluggishness, however, may reasonably be due to the shock it suffers in being suddenly brought to live in surface water. Slight movements of the ends of the tentacles are sometimes the only signs that the animal is still alive. Spasmodically, however, a strength of movement is exhibited which convinces the observer that under natural conditions Nautilus must be looked upon as an active form.[1] It will suddenly sweep from the bottom and bump its shell into a side or corner of the aquarium, — this, too, with considerable energy. At the shock the animal sinks to the bottom, partially retracts, and again remains almost motionless. In these spasmodic movements the animal rarely rises more than three or four inches from the bottom, although on one occasion I observed it swim nearly to the surface, a vertical distance, however, of not more than forty-five cm. During the night-time the movements appear to be if anything less active than during the day. A curious rocking movement is often observed, the animal swinging forward or backward, or from side to side, but never to a degree suggesting a change in the resting position. Rotation — that is, turning the shell to right or left — is very readily accomplished, and without, as far as I could see, any special movement on the part of the siphon. A very slight change in the direction of the water current exhaled from the siphon, aided by a slight leaning of the shell, is evidently enough to account for this ready movement, for the animal is delicately poised and little mechanical impulse is needed. Occasional distinct movements of the hood begin, and tentacles are observed. The hood will partly close, then open again, somewhat abruptly. The tentacles show a peculiar weaving movement ; sometimes they separate quite widely from one another, and then converge. In their function as adhesive organs they will attach themselves somewhat delicately to objects presented to them.[1] When roughly touched, however, they will merely retract. On one occasion only did I observe the separation of the tentacles around the mouth and the protrusion of the jaws, to the degree shown in Fig. 1. I was not able to induce the animals to feed. I noticed, however, that in specimens which had recently died little effort is needed to draw the jaws forward to a surprising degree, so that they would stand well outside of the proximal portions of the tentacles. And I think that there is little doubt that the jaws can be used in a position which one would hardly be led to expect from an examination of preserved specimens. Accordingly I infer that the tentacles are of less importance in the mechanical operation of feeding than is popularly believed. When the jaws are drawn out, as above noted, the tongue is found to lie far forward, curving outward between the tips of the jaws. Nautilus is already well known to have a similar diet to that of other cephalopods. Its fondness for animal food in a decomposing condition I note from hearsay. I found, however, that with its strong jaws and rasping

---

[1] Professor Moseley, in his interesting *Notes of a Naturalist on H. M. S. Challenger*, observed that Nautilus swims with its tentacles "extended radially from the head, somewhat like the tentacles in a sea-anemone; but each pair has its definite and different direction, which is constantly maintained." As far as my own observations go, the exact position of the tentacles during swimming is not easy to determine, for the specimens were closely confined and their movements sudden and short; I am led to conclude, however, that the tentacles are drawn together during sustained movement, like those of other cephalopods. And in this position I represented them, somewhat stiffly, perhaps, in Fig. 1. For the above volume, together with other references to Nautilus, I am indebted to Professor Ijima, who kindly secured them for me in the University of Tokyo and forwarded them to Misaki.

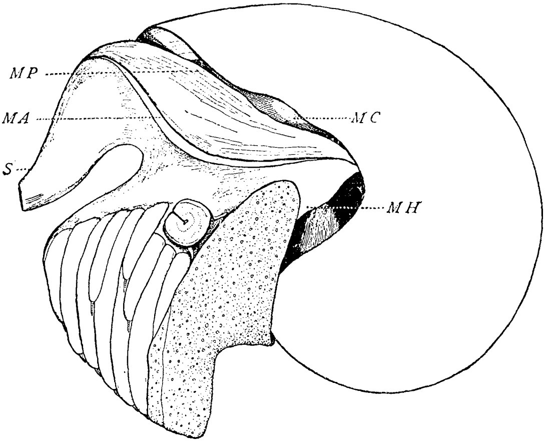


FIG. 14. — Side view of Nautilus shown hanging out of its shell. This position is assumed after the animal has been held for some time hood downward.

---

[1] Willey in his notes convinces me that I have not examined the tentacles when at their best, for he has seen them "adhere so firmly to a foreign body as to become torn away from the animal when the foreign body is forcibly removed." (*Q. J. M. S.*, 1898, p. 207.) His figure indicates that the tentacles when firmly attached become partially retracted, at least as far as their tips are concerned.

tongue it has little difficulty in feeding upon animals which are enclosed in a stout leathery skin. Reference has already been made to the spasmodic movement of the siphonal flaps and of the ventral rim of the mantle; under normal conditions the movement of exhalation is practically confined to the siphonal flaps, the ventral rim of the mantle being closely apposed to the aperture of the shell, just as the portion of the mantle behind the hood is apposed to the black region of the coil. It is not difficult to convince one's self that under natural conditions Nautilus is well able to protrude its "head" quite widely from the aperture of the shell in a way suggested by the position of Fig. 14.

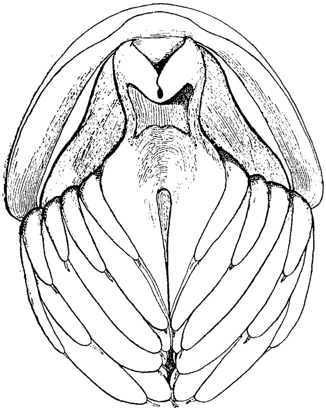


FIG. 15. — Individual of preceding figure shown in somewhat ventral aspect.

Breeding Season, and the Question whether Eggs and Young have been collected by Fishermen. — From the condition of the reproductive organs in five specimens examined I am led to infer that the breeding of Nautilus in the region of southern Negros extends over a considerable season; this evidence, however, is too meager to be of particular value.[1] There is certainly, it seems to me, a fair chance of securing the embryos of Nautilus in this region if what I learned from the fishermen is to be relied upon. One of these men in particular gave such a satisfactory account that I cannot very well doubt that he had at some time seen deposited eggs. And it may be well to state parenthetically that no data were given to the fishermen which they could make use of in their reminiscences. The fisherman in question assured me that on one occasion, as nearly as he could remember it was during the early part of the summer of

---

[1] I find that Willey at first believed that in the case of Nautilus in New Guinea "reproduction takes place all the year round" (*Q. J. M. S.*, 1896, p. 176). After his observations in Lifu, however, he abandoned this conclusion, stating that "it now seems probable that the breeding of Nautilus . . . is subject to a definite law of periodicity" (*Nature*, 1897, p. 403).

1900, he noticed eggs attached to a fish-cage in which Nautilus had been taken : there were several eggs, he did not remember how many, but they were attached not far from one another, and stood up on end, each as big as two joints of his finger, and with a leathery skin. Their color was white, and — this was the curious part of his story — they had brown markings across them[1] which reminded him of those on the shell of the adult animal. It was from the latter feature that he was sure the eggs belonged to Nautilus. His account seemed to me worth repeating, since it is hardly probable that he could have invented offhand so tolerably accurate a story, or that he would have been apt to describe an object which has nothing to do with eggs of Nautilus and yet resembles them so clearly. Moreover, there is a greater probability of accuracy when one considers that such a man is apt to be a skillful observer in matters relating to his work, — a thing which a stay-at-home zoölogist often finds hard to realize. I was assured on every hand that small specimens of Nautilus are relatively common during the fishing season ; that specimens whose shell is the size of a silver dollar are often thrown away, and that still smaller specimens are occasionally taken, in spite of the large mesh of the fish-cage.

---

[1] Could these be the rows of foldings and "fenestrations" of the outer egg capsule which Willey described (*Nature*, 1897, p. 402) ?